TRANSIT-ORIENTED COMMUNITIES ADVANCE SUSTAINABLE CITIES

Linking public transport investments and land development to create vibrant, accessible neighbourhoods and connect urban communities

wsp

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On the cover: Aerial view of Kalasatama, a neighbourhood in Helsinki, Finland – rendering by Voima Graphics

FOREWORD

As we plan and design for communities around the world, public transportation increasingly emerges as the enabler of sustainable urban growth. City populations around the world continue to rise. Over half of the world—more than 4 billion people—live in urban settings, and this number is increasing. By 2050, nearly 7 out of 10 people will live in cities.

Creating livable and quality urban areas requires a fresh and forward-thinking approach to shaping communities. This is no small task as socio-economic issues and environmental challenges intensified by climate change continue to impact decision-making.

Looking toward the future, inclusive growth will figure prominently in planning and design. An essential step in this process is making places reachable and usable for everyone. When considering the drivers of this goal in the broader context of environmental priorities, public transport immediately comes to mind due to its inherent potential to connect communities and accelerate decarbonization. While public transport infrastructure continues to expand globally, communities will benefit from a faster pace of implementation and targeted funding to modernize systems and maintain operations. Transport systems, including the areas around stations, have untapped potential to drive sustainable growth.

This is where transit-oriented development (TOD)—increasingly transit-oriented community (TOC)—can play a vital role. By integrating land use and transport, TOD/TOC provides the means to implement accessible and connected mobility options, leading to reduced congestion, better air quality, greater connectivity within and between communities, job opportunities, improved public health, resilience to climate change impacts, and thriving neighbourhoods.

We are delighted to share our evolving understanding of transit-oriented development and projects notable for shaping great places, connected communities and sustainable cities around the world.

Eric Peissel
Global Director of Transport and Infrastructure

INTRODUCTION

Around the world, urban population growth requires city leaders and the private sector to rethink how to create sustainable neighbourhoods, communities and cities.

One technique applied over the past several decades to shape urban-area infrastructure is transit-oriented development (TOD). TOD incorporates a compact city-planning model to form a community based on mixed-use development[1] in the immediate environs of a public transport/transit station. The overarching goal is to provide for people's daily needs within a reasonable walking distance of the station, reducing dependence on cars by providing access to reliable public transport modes such as rail and bus. Redesigning and developing the urban form with the appropriate level of density[2] and connectivity around stations encourages efficient use of land and energy while supporting active travel and a modal shift from private vehicles to public transport.

While this form-and-function structural principle is the foundation of TOD, curating community through human-centred design and sustainable mobility has been emerging as a central point to guide development over the long term. Mixed-use development—including a range of housing options and amenities around integrated public transport hubs—with a focus on equity-driven community solutions is the route to sustainable urban development.

To achieve this goal, it is necessary to prioritize ways that enable places to thrive and become sustainable communities—economically, socially and environmentally. Sustainable development depends on successful management of how cities grow and densify[3] while also improving livability for residents.

Density plays a context-specific role in the implementation of TOD. For example, in Asia, high density and high-rise construction are seen as standard for maximizing land-use efficiency. However, in Europe, such developments can result in oversized urban spaces that conflict with local culture, climate and daily life. Density required for financially viable TOD varies significantly across regions/countries—due to differences in land values, transit systems, urban planning policies, development provisions and cultural expectations.

The ultimate success of all TODs hinges on creating accessible, connected, vibrant and welcoming areas through diverse land use centred on transit. From a planning and design standpoint, a systems-thinking perspective enables the consideration of the interdependent aspects that form places where people look forward to living, working and spending time. This comprehensive picture includes a range of housing opportunities, well-connected transport systems and other essential services, plus life-enriching amenities such as an inviting public realm.

Urbanization Snapshot

Today, some 56% of the world's population – 4.4 billion inhabitants – live in cities. This trend is expected to continue, with the urban population more than doubling its current size by 2050, at which point nearly 7 of 10 people will live in cities. [World Bank Group]

The most urbanized regions include Northern America (with 82% of its population living in urban areas in 2018), Latin America and the Caribbean (81%), Europe (74%) and Oceania (68%). The level of urbanization in Asia is now approximating 50%. In contrast, Africa remains mostly rural, with 43% of its population living in urban areas.

India, China and Nigeria together will account for 35% of the projected growth of the world's urban population between 2018 and 2050. [United Nations]

Sustainable development cannot be achieved without significantly transforming the way we build and manage our urban spaces.

Making cities sustainable means creating career and business opportunities, safe and affordable housing, and building resilient societies and economies. It involves investment in public transport, creating green public spaces, and improving urban planning and management in participatory and inclusive ways.

Sustainable Development Goal (SDG) 11 – Sustainable Cities and Communities. [United Nations]

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1 Mixed-use development indicates the diversification of land use, including residential, commercial, cultural, institutional and entertainment.

2 Density means optimal concentration of people, opportunities, and quality housing near sustainable transport options; it does not mean overcrowding. Institute for Transportation and Development Policy (ITDP).

3 According to the ITDP: Densify ensures enough activities to support transport service and make neighborhoods self-sustaining.

Exploring the Benefits of TODs

When using land and natural resources around public transport efficiently, transit-oriented development can counter sprawl and support sustainable urban growth. Car-oriented development supports sprawl, causes air pollution and increases greenhouse gas emissions. More energy, more resources and more land are required for car-oriented development compared to transit-oriented development.[4] With a focus on dense centers and transport nodes, rather than low-density car-oriented growth, TOD reduces the need to develop rural areas and valuable open spaces.

TOD can also support safer mobility through well-designed pedestrian access to public transport. By advancing mobility connectivity within and between communities, TOD can relieve congestion in metropolitan areas. Greater connectivity opens opportunity for people with disabilities, young people, the elderly and people who do not own cars or prefer not to drive with the ability to use multiple modes of transportation for point-to-point travel, especially when active transport and micromobility options are linked to station hubs.

TOD can help revitalize aging downtowns and declining urban neighbourhoods and enhance revenues for local authorities where revenues are linked to property values or retail sales.

TOD can provide real benefits for transit agencies. Maximizing housing and employment near stations can drive ridership demand. The joint development, selling, or leasing of agency owned properties near a station can provide a revenue source for the agency. TOD, as part of a quality urban environment, can improve perceptions of a station area and increase property values. This increase in values can be captured to finance additional investments in transit.

Moving from TOD to TOC

To achieve United Nations Sustainable Development Goal (SDG) 11, it is necessary to shift from a traditional perspective of TOD to an evolving understanding of TOD based on community: where public transport anchors transit-oriented urban form, combining contextually appropriate density, diversity of land uses and high-quality design to foster flourishing communities that can easily connect to other communities. This emphasis on community, as expressed by transit-oriented community, or TOC, requires placemaking—to create inviting and inclusive public realms—and equity-driven solutions when planning for TODs.

From a planning and design perspective, community-focused outcomes result from the combined efforts of people who work with form, activity and meaning to support and enhance the value the community places on a given location.

Form is shaped by developers, architects, landscape architects and transport planners; activity refers to frequency of transport and curation of public space; and meaning involves public art, local/indigenous engagement and interpretation. Upfront integrated planning involving all of these stakeholders and public engagement is key to developing momentum and consensus toward delivering sustainable outcomes—economically, socially and environmentally.

Four guiding principles can help achieve this shift to community in long-term planning:

- Design for People
- Respond to the Market
- Connect to public transport/transit
- Be Future Ready

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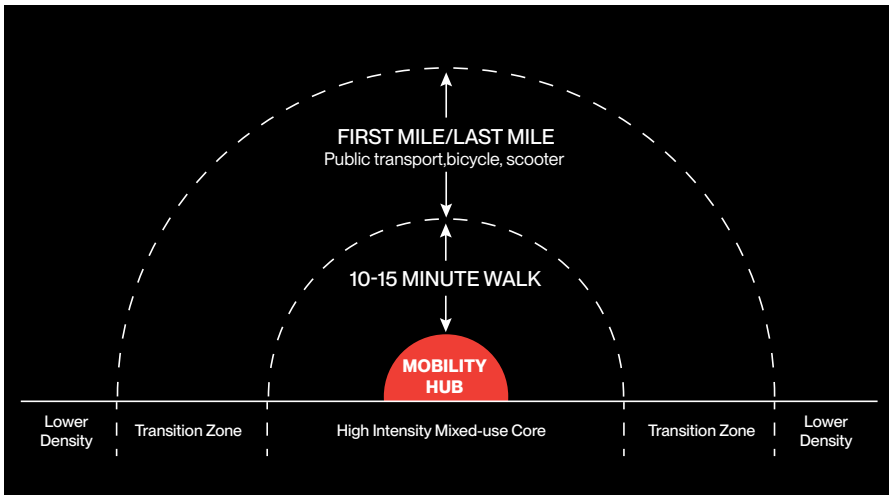
4 Institute for Transportation & Development Policy.

In this paper, we explore each principle and present associated project examples from around the world involving WSP. These examples represent complete TODs or infrastructure aspects, physical and social, that support transit-oriented form. Before delving into the core principles, it is instructive to point out that the local context within cities and suburban areas influences the particular features of each TOD, and different approaches to TOD globally result in varying representations.

Worldwide, TOD is characterized by development within a walkable distance from a transit station, known as the catchment area. This distance varies depending on the climate; in a temperate climate, the area is typically within a walking radius of 10 to 15 minutes. Sometimes, a chain of TODs can be developed along a transit corridor comprising a network. Other times, TOD can focus on the station itself with the possibility to build above the station as an integrated development called oversite development, which is often used as a way to recoup cost to cover the capital investment in upgrading the transit station.



As cities may face similar but slightly different urban challenges, how TOD/TOC can be leveraged to resolve these challenges will vary accordingly. Some cities may have a well-established transit network but apply TOD to their urban planning retroactively or when planning for land extensions. Some megacities in countries within the Global South[5] may still need a transit system and use TOD to restructure their city to guide future growth.

Through our experience working across world regions, we continue to evolve our approach to developing urban form. WSP's involvement in TOD projects, includes master planning, multimodal planning, landscape design, station design, feasibility studies, safety assessments, environmental impact studies, market analysis, land value-capture studies and other infrastructure-related services, such as Vision Zero road safety and the Complete Streets approach,[6] which support sustainable mobility development in communities.

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5 The phrase Global South refers broadly to the regions of Latin America, Asia, Africa and Oceania. The term has gained popular use among leaders and commentators on international politics to help describe global divisions and to group together countries with common positions on global issues. Reference: "What is the Global South?" House of Commons Library, UK Parliament, July 11, 2024. The use of the phrase marks a shift from a central focus on development or cultural difference toward an emphasis on geopolitical relations of power. While the term is not geographically accurate, this paper uses the term rather than developing countries, which implies that development can only be achieved in the same manner as developed countries, part of the Global North, the regions of North America, Europe, Australia and East Asia.

6 Aiming to create a worldwide road transport system where no human being is killed or seriously injured, Vision Zero challenges system designers to adapt, as contextually needed, road systems to advance safe mobility for all road users. The Complete Streets approach aims for safe access to streets for all people who need to use them, including pedestrians, bicyclists, motorists and transit riders of all ages and abilities. Complete streets concept is explored in the WSP Vision Zero brochure.

DESIGN FOR PEOPLE

Several key concepts help to develop quality places for people—a whole-neighbourhood approach, respect for the local community and location, and an inviting and inclusive public realm.

Whole Neighborhoods

Incorporating the elements of a neighborhood with amenities and services within walking distance of each other encourages pedestrian activity and enables active street life to support a vibrant public realm. Designing whole neighbourhoods involves the diversification of land uses, complementing each other, around public transport stations. For a TOD to displace the need for cars, local trips for socializing and recreation, education, childcare, shopping and personal business need to be accommodated around the station or via good active-travel links paired with reliable, efficient last-mile solutions for destinations beyond the reach of walking and cycling.

Figure 1 – In the United States, for the Vancouver Waterfront Park in Washington State, WSP extended the Waterfront Renaissance Trail to link parks and greenery with downtown and adjoining new housing and commercial development. (WSP prepared the master plan and construction phase documents as well.)

Figure 2 – Avon River neighbourhood / Te Papa Ōtākaro – Christchurch, New Zealand – As the first stage of Te Papa Ōtākaro/Avon River Precinct project, WSP worked with BDP and EOS Ecology to transform the health of the Ōtākaro/Avon River through the central business district via a comprehensive remediation package of works including silt removal, riverbed remediation, habitat creation, river narrowing, fresh plains creation, native riparian planting and improved accessibility to the water's edge. WSP provided a range of services including landscape architecture, archaeology, planning, surveying, contaminated land, transport planning, and flood, civil, bridge, traffic, and geotechnical engineering for Te Papa Ōtākaro/Avon River Precinct project.

Looking at the current demographics of a place is a good starting point to make a reasonable estimate of the future demographic make-up of a TOD, even where there is major built-form change. This base understanding of the existing demographic makeup should be expanded upon with an understanding of the broader real-estate market to consider all potential future residents in the planning process. (Respond to Market, p. 17, explores this point.) Overall, TOD needs to be feasible to deliver and be able to fulfill the daily needs and quality-of-life factors for all members of the community—as represented by the shift to TOC. Understanding and including these factors is essential to forming an integrated vision. Upfront integrated planning with all relevant stakeholders is key to developing momentum and consensus toward delivering sustainable outcomes.

When designing for TOD at the station area, it is best to think of the whole station catchment/ vicinity around the public transport station, locating commercial uses, for example, along the busy road or rail corridor, to buffer more sensitive uses, such as residential development, from noise and air-quality disbenefits. Creating a successful whole neighbourhood entails balancing a range of needs; schools and parks, which require a large land take, need to be considered, though possibly in tension with other goals of a TOD, such as urban density, within the walking catchment.

In Australia, Sydney Olympic Park is setting a new standard in community living and sustainability in New South Wales. The Sydney Olympic Park Master Plan 2050 leverages investment in Sydney Metro West and Parramatta Light Rail Stage 2 to reimagine Sydney Olympic Park as a series of residential neighbourhoods and parklands, which together will bring more housing and greater affordability, generate activity and employment, and provide green spaces to support local and

Figure 3 – rendering: courtesy of Mark Gerada and the Sydney Olympic Park Authority – Aerial view of the urban centre neighbourhood of Sydney Olympic Park. In the image, the development is centred on the Sydney Metro West Station (marked as M, middle left) as the Parramatta Light Rail passes in the foreground adjacent to the Olympic Stadium. The careful placement of height and open space reduces overshadowing, improves solar access and supports a welcoming environment. This TOD is also supported by new cultural and community facilities as well as direct access to the adjacent urban parklands through walking and cycling links. WSP has guided and supported the delivery of land use and transport integration at this legacy Olympic precinct continuously for over 32 years.

regional biodiversity while ensuring opportunities for active and passive recreation. This emerging community—which has already been awarded the highest possible Green Star Rating of 6 stars (by Green Star Communities) for excellence in sustainability relating to governance, livability, economic prosperity, environment and innovation—is set to ultimately accommodate 13,000 homes and up to 32,000 jobs within a connected and livable suburb, adaptive and resilient to a changing climate.

Once an industrial port area in Helsinki, Kalasatama began its transformation into a modern urban neighborhood in the early 2000s. Currently, Kalasatama is home to around 9,000 residents. The area is being developed to accommodate homes for over 25,000 residents and provide more than 10,000 jobs. Kalasatama will feature dense urban development and become part of the city's central area. The neighbourhood is designed to encourage walking, cycling and the use of public transport, reducing reliance on private cars. Dedicated bike lanes, bike storage facilities and bike-sharing stations encourage cycling as a primary mode of transport. Certain areas of Kalasatama are designed to be car-free, creating more pedestrian-friendly spaces. The Kalasatama metro station links the neighbourhood directly to Helsinki's city center, while tram connections, including the Kalasatama-Pasila line and future Crown Bridges tram route, will further integrate Kalasatama into the city's transit network.

Figure 4 – rendering: courtesy of Marc Gerada and the Sydney Olympic Park Authority – showing the heart of the planned urban centre neighbourhood of Sydney Olympic Park centred on the new Sydney Metro station and adjacent community open space where walking, wheeling and cycling take priority over local access for private vehicles.

Figure 5 – rendering: courtesy of Voima Graphics – Aerial view of Kalasatama. In the image, the center of Kalasatama centre is marked by tall buildings (middle right toward the background), which house the metro station and a shopping center. Green roofs enhance residential comfort and play a vital role in addressing the challenges posed by urbanization and climate change. In dense urban settings, green roofs (middle foreground) help regulate stormwater runoff by reducing flood peaks and also contribute to mitigating the urban heat island effect. WSP has been involved in designing the tramline extending from Nihti through Kalasatama Centre to Pasila, as well as numerous streets and green areas associated with the project.

Local Community and Location

Respecting a local community and locations within that community can reinforce a sense of belonging and is a means of passing down the history of a place to the next generation. While TOD can often be formulaic, TOD design through architecture, public art and shared spaces can reflect the physical, cultural, historical and social identity of a place. This endeavour is part of placemaking through master-planning opportunities, bringing together a multidisciplinary team to work with the community. Creating a unique and memorable destination will enrich the lived experience of residents and encourage visitors to return. Increased focus on pedestrian-centric environments promotes an enhanced place.

Public Realm

Inviting

Successful TODs offer great places characterized by inviting and inclusive public realms—vibrant streets filled with activity and pedestrians, parks of different sizes and scales that offer a calming refuge from urban life, and plazas for people to meet and socialize. Buildings should impart visual interest and support activity and interaction. Creating a public realm that provides a safe, comfortable and pleasing environment attracts both people and private investment. An inviting public realm can also be a tool for economic development by helping to keep and attract talented individuals in a community.

Creating an inviting public realm was central to the Paddington Square development in London, which integrates the station with the commercial development above it and the surrounding area. Paddington Square provides a new gateway into London from Paddington Station—a public transport hub serving six rail links including the Elizabeth line. Completed in 2024, Paddington Square—the centrepiece for the district's wider generation—has improved access to public transport while helping to revive a previously neglected part of London's cityscape, generating job opportunities and boosting the local economy.

Figure 6 – Designed and developed by Renzo Piano Building Workshop (RPBW) and WSP, Paddington Square features shops, cafes and public spaces including a pedestrianized piazza displaying public art. The oversite development contributed to the funding for the station upgrades, including step-free access to the metro and an enlarged ticket hall for the Bakerloo line. WSP provided full multidisciplinary services for the project, working closely with the development manager, investor and architect to achieve the vision for Paddington Square, including the sustainability goals.

Figure 7 – Santiago, Chile – Forestal Park is an urban park in the historic downtown, surrounded by mixed-used buildings (commercial and residential) of different densities, bike lanes and access to multiple subway stations. The park is frequented by, locals, people from neighbourhoods nearby and tourists, thanks to its high-quality transit connections and proximity to other attractions, such as the Bellas Artes National Museum and lively Lastarria Neighbourhood. The city has grown around the park, and the area is an example of a naturally occurring TOC.

Figure 8 – Santiago, Chile –The city's historic downtown has evolved to increasingly accommodate transit and all modes while retaining its identity. On the left, colourful metro station Bellas Artes provides open space for social interaction, surrounded by street-level cafes and businesses, topped by residential and office spaces, on an intersection of an increasingly pedestrianized street that allows for all people to freely move. Bike-share stations and slow-moving traffic allow for multimodality. On the right, recently pedestrianized Paseo Bandera has led to renovation of the historic financial district and the several commercial, residential and office buildings surrounding the area.

In transit-oriented development, understanding networks and hierarchies is essential. One aspect of developing an inviting public realm is to identify the role of different kinds of streets and plan them accordingly—a Complete Streets approach. The idea is to plan a holistic network where different modes serve their purpose in the best possible way. This type of planning is key toward shifting to more sustainable transport systems and transit-oriented urban form, where people shape their travel habits around public transport with an emphasis on active transport modes.

Figure 9 – image: courtesy of Ants Vahter – Esplanade in Helsinki, Finland – Wide sidewalks with seating areas make the streets more pedestrian-friendly and pleasant for social interactions. The use of sustainable materials and the integration of green infrastructure align with Helsinki's strategic goals for a low-carbon, attractive city center.

In Helsinki, the newest planning guidelines identify different street types according to the role and level of freedom a pedestrian has in that specific streetscape. Pedestrians have the most influential role in determining the nature of the urban realm: more people on the streets means more life in the urban realm. This approach to the mobility environment encourages walking and cycling within the TOD toward creating a vibrant public realm. Among the street types are free space, shared open space, and soft traffic space.

Figure 10 – Free space – Helsinki(left) and Hamburg (right) – refers to a pedestrian street or square where a person can walk freely without having to worry about car traffic. Free space allows more inventive solutions, experiments, events, art and small-scale details.

Figure 11 – Shared open space—Stockholm (left) and Tallinn, Estonia (right)—refers to a street area where pedestrians and cyclists have priority and can safely and naturally use the entire width of the street. Motor-vehicle access is permitted on a limited basis and must proceed on pedestrians' terms—slowly and with consideration for others.

Figure 12 – Soft traffic space – Stockholm (left) Helsinki (right))—refers to a street where pedestrians have their own space, separated from motor-vehicle traffic, with design solutions that prioritize pedestrians. Structural measures maintain a moderate volume of motor-vehicle traffic and low speeds.

Inclusive

TOD can advance inclusivity through greater public transport connectivity, a design for active transport modes around public transport and the sense of community associated with this type of development. Prioritizing the needs of residents, both existing and future, supports inclusive outcomes. In some geographical areas, gentrification and displacement are risks of development and growth that may drive out those in greatest need.

A well-planned mix of uses can be an effective strategy to attract a diversity of users to a TOD. Similar consideration must be given to the public realm to create an environment that is welcoming and accessible to all, including the physically disabled and neurodiverse, and supports walking and cycling across a transit corridor.

We have found that fostering inclusive public transport is greatly influenced through the design of the public realm, specifically the routes around public transport stations. WSP research in Australia including the "Safer Cities Survey" and "Data After Dark" for the New South Wales (NSW) Government revealed that the quality of the public realm was a key factor in whether people would use transit at all. Lighting, sightlines, a well-maintained space and having other people around were all major elements identified in making public space more inviting and people feel safer. Design factors and issues around inclusivity were explored in-depth in the WSP report focused on gender-responsive design to foster inclusive transport.

In London, the Old Oak Common HS2 Station public parkland is setting the stage for a vibrant new community around the station and wider-area regeneration. Fundamental design principles for Old Oak Common public parkland are people, place and time. The goal is to create a parkland that is inclusive and rooted in the historic character of the existing neighbourhood while considering the evolving character of the area, and one that connects the station to the local neighbourhood through embedded biophilic design. The design integrates historic flora into the future landscape around Old Oak Common Station, engaging users' sensory experiences as they walk to and from the station.

To provide inclusive and accessible places, the design process emphasized a human-centred and neurodiverse perspective, engaging design experts and the Built Environment Accessibility Panel (BEAP) in the United Kingdom.

Figure 13 – Together with our partner Grant Associates, WSP designed the HS2 Old Oak Common Station plaza as a new public parkland in London. HS2 Old Oak Common Station's public parkland places people at the heart of the design process. The images illustrate the robust and adaptive design, providing a sensory-rich experience for users throughout the seasons.

RESPOND TO THE MARKET

Understanding the real-estate market and the demand for land uses is an important piece of planning for TOD. This understanding includes grasping market realities to determine to what extent real-estate-market demand will drive TOD. Such knowledge can then be used to identify the economic incentives and other subsidies that may be needed to catalyze development.

A real-estate-market analysis evaluates sales trends to gain insights into property values, the supply and demand for certain land uses, and future real-estate-market trends. A feasible plan for TOD and land use responds to real-estate-market demand with a financing-and-funding plan that considers rental income, construction costs, whole-life operating expenses and desired returns on investments. It is important to understand real-estate demand across the entire transit corridor, not just at a specific station area, so that the mix of land uses within a station area is complementary to land uses across the corridor. The mix of land uses at each station should balance an overall land-use strategy for a transit corridor with a community-led design approach at station areas that recognizes the unique strengths and locational advantages of each station location. This can help to not oversaturate the market with a single building typology; a mix of uses across the corridor can also drive transit use.

TOD should positively impact and attract residents while also protecting against actions that may have unintended negative impacts on the residents and legacy businesses. A real estate-market-analysis should be informed by community needs, which may not show up in such an analysis. Achieving this outcome requires a public-engagement process aimed at understanding community needs; the results of this process are coupled with knowledge gathered through an equity analysis, which considers social infrastructure needs—such as health services, educational institutions, grocery stores, cultural centers and parks—that are often not identified through the real-estate-market analysis.

Figure 14 – United States – Kay Bailey Hutchison Convention Center Dallas Master Plan, Dallas TX

In the United States, the Kay Bailey Hutchison Convention Center Dallas (KBHCCD) Master Plan in Dallas, Texas supports the expansion of the Kay Bailey Hutchison Convention Center by integrating a convention center master plan, a transportation master plan, a multimodal hub study, an area plan, and a funding and financing plan to support one integrated vision. The area plan focuses on improved connections between the KBHCCD, the multimodal hub, downtown, and the Cedars neighborhood with 30 acres of walkable mixed-use transit-oriented development, a network of parks and open space, and a bridge park over Interstate 30 (I-30), which connects to South Dallas. The funding plan avoids placing increased financial burden on city residents.

In the United Kingdom, WSP has been playing a key role since 2012 in supporting HS2 Ltd's vision for the design of the high-speed railway since. Our involvement has grown to include supporting designs for Birmingham Curzon Street, London Euston and London Old Oak Common stations, as well as potential future designs for Manchester Piccadilly and Manchester Airport stations, helping to realize the potential for urban regeneration and sustainable development represented by this transformative project. Curzon Street (Figure 15), for example, is expected to be one of the country's busiest transport hubs. Establishing an intermodal transport hub can drive greater market value for development. WSP's design both for Curzon Street station and its public realm aims to transform a brownfield site into a vibrant public space that supports regeneration.

Figure 15 – United Kingdom – HS2 Curzon Street Station design considers the integration of the multimodal interchange and its interaction with the public realm to support wider regeneration.

Understanding Community and Equity Needs

With a market-based understanding and clear definitions of community success in mind, the likelihood of TOD plans becoming a reality can be significantly improved. Development subsidies can encourage activities that lead to a more equitable distribution of resources; leveraging local community partners and institutions can help to meet community needs with equity-driven solutions.

In the United States, WSP worked with the City of Raleigh in North Carolina on the Equitable Development Around Transit Study to identify the growth and affordability goals along future Bus Rapid Transit (BRT) corridors in the city and provide a TOD framework to fully and equitably realize the benefits of BRT in Raleigh. The guidebook is unique in that it combines policy recommendations and TOD design guidelines.

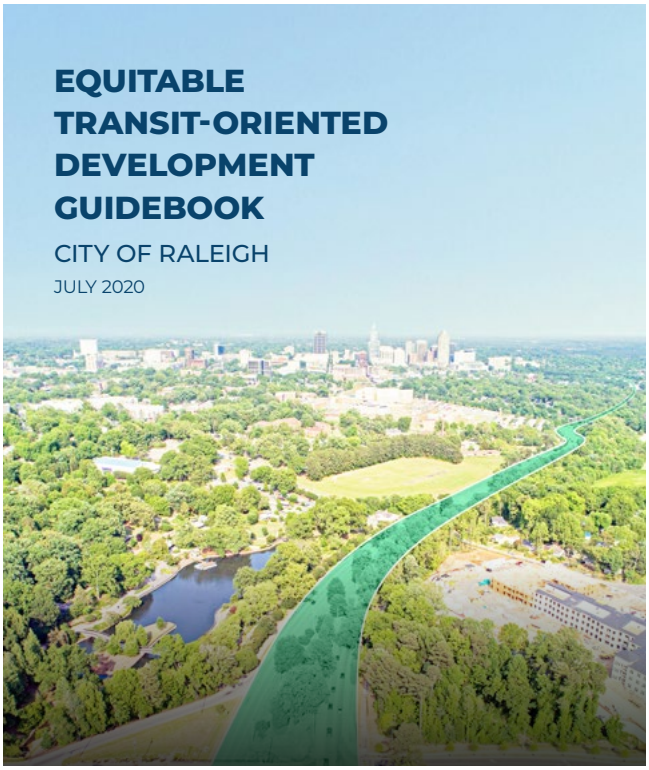

Figure 16 – A key outcome from the Equitable Development Around Transit Study is a citywide Equitable TOD (ETOD) Guidebook. The guidebook provides a toolkit of strategies to leverage transit investments for sustainable growth. The ETOD guidebook is unique in that it provides both a policy foundation and a set of design principles to guide subsequent planning efforts.

The importance of understanding community preferences has been demonstrated by the NIMBY (not in my backyard) phenomenon in many areas including the United States, the United Kingdom, Canada, Australia, New Zealand and China. Discussion about NIMBY can initially be perceived as opposition to development, but this idea could equally be understood as residents opposing new development based on previous development perceived to lack quality. Therefore, the curation of good places is essential to progressing transit-oriented urban form, with government supporting this shift through quality development.

In China prior to the 2000s, the NIMBY sentiment prevailed. At the same time, many cities started to develop a comprehensive metro network as they contended with congestion problems; people found the metro to be reliable and became interested in living close to a metro station. In China today, the government promotes the TOD concept in many cities with the support from international funding (e.g. World Bank), and developers use TOD as their marketing strategy. Nonetheless, TOD is not as successful in China as in Hong Kong due to a high reliance on private modes of transport and statutory requirements that prevent the full application of the TOD concept.

Cities in Asia—having higher population densities coupled with late industrialization in comparison to European and North American cities—tend to develop their cities in a compact city model with an emphasis on public transport. This approach can be seen in Hong Kong, Singapore and Tokyo.

Many of the more established cities in Asia experienced a population boom from the 1950s-80s, and mass transit was identified as the means to enable the continuous growth of the cities while preserving a certain quality-of-life level from social and environmental perspectives.

Figure 17 – This project, developed by OCT Group, a state-owned enterprise based in Shenzhen, China, represents a future TOD city model. Located in the core area of Wuhan's high-speed rail business district, the total construction area exceeds 2.4 million square metres. The development comprises diverse spaces, including business offices, neighborhood street retail, hotels, indoor theme parks, cultural and creative exhibition venues, residential areas and educational institutions. WSP is responsible for the overall transport planning and traffic-engineering design of the development.

Japan is considered the pioneer of TODs in Asia with many examples integrating rail and mixed-use development. When Japan privatized its railway in 1987, railway corporations started looking for alternative non-ticket revenue to supplement operation and capital expenditure for line upgrades. With the transfer of railway-related assets from the public to private corporations, Japanese private railway corporations began to experiment with railway-related property development and the subsequent TOD planning around the station to optimize the environment around the station for better land value-capture.

Hong Kong started to replicate the land value-capture model from Japan with the introduction of Railway plus Property (R+P) business model. MTR Corporation (MTRC), the operator of the mass transit railway and the majority landowner around the new stations, master-planned the surrounding environment to encourage greater use of public transport, guiding integration of the station with surrounding development. This included oversite development or grade-separated pedestrian passages to connect to key destinations around the station, enabling a high-quality point-to-point experience for metro users. High-density development was planned around the station as it is the most accessible area within the city, subsequently delivering a 15-minute city model.

The concentration of business, residential, leisure and social uses around the station increases the land value further; MTRC started to move forward with mixed-use development adjacent to or above the metro station, capturing commercial value to repay its railway capital investment. MTRC also retains ownership of commercial properties for rental income and other TOD-related income, such as bus services for last-mile coverage and property management services for adjoining multiplex development, to cover the daily maintenance expenditure for the metro system.

The design of LOHAS Park in Hong Kong demonstrates this comprehensive TOD approach with a focus on creating a pedestrian-friendly environment. It includes walkways, cycling paths and easy access to public transport, reducing the reliance on private vehicles.

LOHAS Park is situated in Tseung Kwan O, the town at southeastern tip of Hong Kong's New Territories mainland and connected to the MTR's Tseung Kwan O Line, with the LOHAS Park Station serving as a central hub for residents to commute to various parts of Hong Kong. This development serves as an example of how to create a quality mixed-use community including the use of previously unwanted sterile land around a railway depot and railway infrastructure—in effect removing negative urban space by building around and above the station and depot.

Figure 18 – Hong Kong – LOHAS Park is a mega-scale TOD residential project integrating residential, commercial and recreational spaces with public transport to create a sustainable and convenient urban environment. The 330,000m2 estate is divided into 13 phases, with 50 high-rise residential towers offering 21,500 apartments to accommodate 58,000 residents in the site area. Apart from residential development, LOHAS Park will also include a shopping mall upon completion. WSP has been providing multidisciplinary services to several clients throughout different phases of the development.

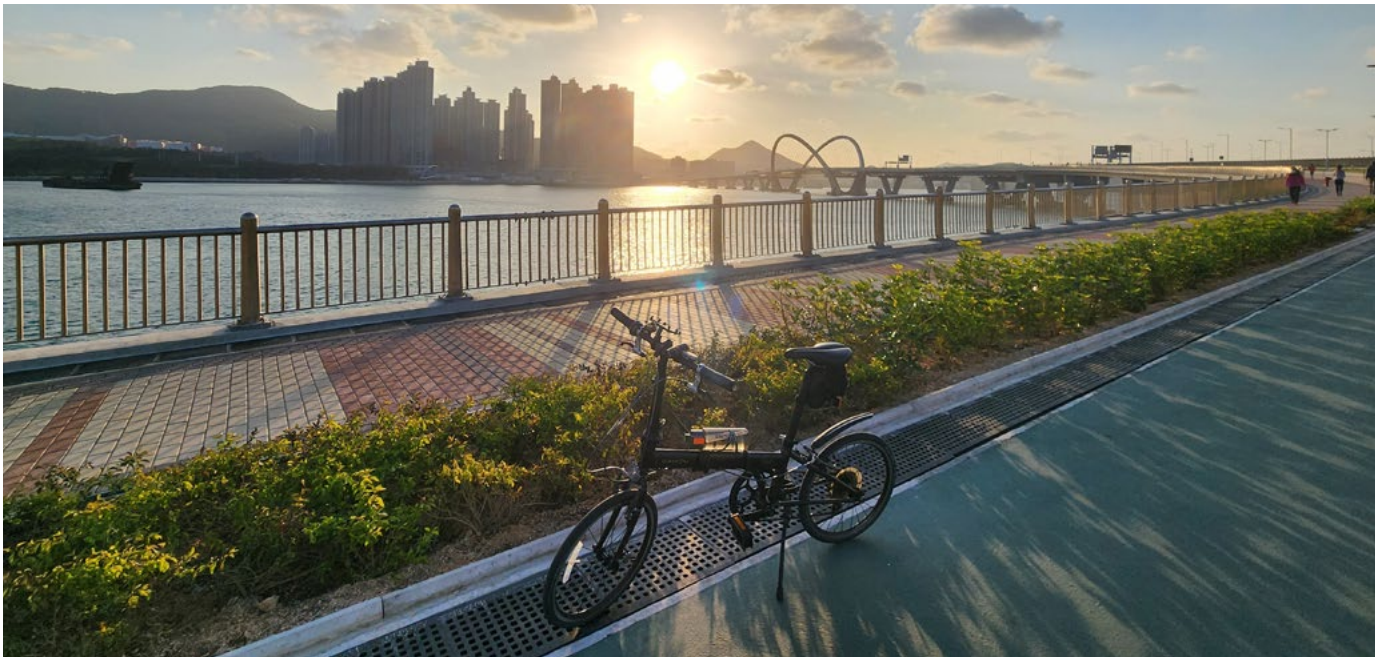

Figure 19 – LOHAS Park is in the background. The harmonious coexistence of pedestrians and cyclists in the Tsueng Kwan O District of Hong Kong results from meticulous planning of the walking network under TOD concept.

Identifying Implementation Strategies

While countries and regions have particular planning and implementation approaches for TOD, a common starting point should be establishing development goals to help set long-term visions and objectives for growth and development, whether for a region, subregion or urban centre. These goals, supported by strategies and spatial plans, can and should act as signals for building partnerships around community and market needs—partnerships involving the public sector, the private sector, infrastructure providers (both hard and soft) and local communities. It is also important to identify who will be responsible for providing what and when toward achieving the vision identified to bring about a successful TOD. Succinct objectives should be linked to measurable indicators for vision-keeping. For example, establishing a walkable town centre involves the consideration of block length, intersection density and amount of public open space.

The need for good process is also a common denominator for success across regions. The role of government, or setting up governance, to facilitate the market comes into play here. For example, in New South Wales, the government is trying to unlock owner-builders and small builders for medium density through the TOD State Environmental Planning Policy, which changes broad planning rules within 400 metres of stations.

Increasingly in Australia, a place-led agency approach is being favoured with a single agency having responsibility to deliver the TOD neighbourhood. This focus departs from established practice where a split of functions between the planning department and transport department has sometimes led to friction, particularly in relation to non-transit trips where prioritizing walking and cycling and the delivery walkable goods and services is desirable but not often funded and delivered. With the more evolved approach, government can act as master-developer, setting the master plan and undertaking needs assessments. In NSW, a new city, Bradfield, is being developed with a public authority, Bradfield Development Authority (BDA), taking the lead to incentivize the market and open up opportunities for private development to maximize the value-creation and contribute to the long-term success of the place. Here they propose to lease land for 25 years so that the market can activate the city centre with a retail hub until enough people are there to justify construction of the cultural use (and a larger permanent retail offering).

In New Zealand, the central government has had a number of programs to seek appropriate urban development/intensification in the country, such as through growth partnerships with lead councils (local bodies). From a national planning direction perspective, the National Policy Statement on Urban Development (NPS-UD) 2020 requires that all councils implement national directions to establish New Zealand's towns and cities as well-functioning urban environments that meet the changing needs of the country's diverse communities. It removes overly restrictive barriers to development to allow growth "up" and "out" in locations that have good access to existing services, public transport networks and infrastructure.[7] The NPS-UD applies to councils in different ways, depending on whether they are growth areas. The core objective of the NPS-UD is to achieve "well-functioning urban environments that enable all people and communities to provide for their social, economic, and cultural wellbeing, and for their health and safety, now and into the future." NPS-UD specifies the need to provide good accessibility for all people between housing, jobs, community services, natural spaces and open spaces, including by way of public or active transport and consideration of walkable catchments, a key implementation opportunity through TOD.

New Zealand has some new transport projects that have a higher likelihood of prompting TOD development, including Auckland City Rail Link, due to open in 2026. This project could be a catalyst for private developers to take up intensification opportunities around the new stations being provided and along the route, particularly given the reductions in travel time to Auckland's City Centre and surrounding inner city fringe employment areas. Another opportunity is with a new central rail corridor, known as Avondale to Southdown, where corridor protection is in place and land has been set aside. This west-east rail connection runs through brownfield areas and presents future opportunities for appropriate intensification and a TOD urban form around potential new stations.

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7 National Policy Statement on Urban Development 2020, ministry for the Environment, Manatū Mō Te Taiao.

The Greater Christchurch Spatial Plan 2024 sets out a 30-year vision for the wider Christchurch area in a partnership with local councils, central government agencies and local Indigenous People (mana whenua[8]). By 2050, up to 700,000 people could be living in Greater Christchurch– 40% more than there are today, with the population potentially doubling to 1 million people in the future. The long-term vision for this growth area includes a proposed mass rapid transit (MRT) network as a city-shaping initiative with targeted intensification identified around centres, corridors, and proposed stations. A significant proportion of Greater Christchurch's growth over the next 30 years is proposed to be focused along these corridors due to MRT investment, which will set the stage for higher-density developments and mixed-use areas.

Mixed-use development, fundamental to TOD, comes with additional challenges beyond those associated with single-use development. Developers must build the right quantity and mix of uses so that the space leases within a reasonable period of time; mixed-use structures are often more expensive to build, operate and maintain. In the United States, for example, investors and banks that finance mixed-use buildings may have different programs and requirements for residential and commercial loans or they may provide financing for some but not all of the uses in a mixed-use building, making financing more difficult. The one-of-a-kind neighborhood retailers that lend authenticity to TOD often lack the financial resources to develop their space, requiring additional support to succeed.

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8 In the consenting context, mana whenua means the Indigenous People (Māori) who have historic and territorial rights over the land. It refers to iwi and hapū (Māori tribal groups) who have these rights in Tāmaki Makaurau, Auckland. Reference: Auckland Council.

CONNECT TO PUBLIC TRANSPORT/TRANSIT

Creating accessible routes for all transit users between stations and the surrounding area is essential to establish a mutually beneficial relationship between land development and public transport. This process involves integrating seamless links for pedestrians and cyclists as part of the urban realm.

Figure 20 – WSP conducted extensive transportation modeling to support development in the city of Markham. This work included macro-modelling, microsimulation, and intersection assessment. Additionally, WSP completed the roadway functional design focusing on a complete streets approach, a transit network plan, active transportation plan, parking strategy and transportation demand management strategy.

In Canada, TOD is a significant component of planning for and leveraging mass-transit investments, in particular in the Greater Vancouver and Greater Toronto Areas. Urban regions strategically identify intensification areas near rapid transit, advance specific zoning and guidelines and monitor progress. While implementation varies jurisdiction by jurisdiction, TOD and coordination between transit mega-investments and land-use intensification is generally adopted as good planning practice across the board in major urban areas.

The province of British Columbia has taken a key role in facilitating densification near transit, advancing a policy framework to leverage current and future rapid transit investments. The regional transit authority has developed a TOD guidebook to streamline implementation that prioritizes walking and cycling within TODs and rapid transit for external trips. The transit authority monitors impacts, including metrics such as the percentage of total area, regional population and employment within 400 to 800 metres of rapid transit stations. The result is a ribbon of high-density, mixed-use communities along rapid transit lines that render sustainable transportation modes as the most time- and cost-effective means of travel for and between most of the city's population and employment clusters.

North of Toronto, the Bridge Transit-Oriented Community, demonstrates the coming together of mobility modes around a station. This mixed-use community in the process of being implemented will be integrated

with the future Bridge Subway Station located in York Region, north of Toronto. The station will be served by the future Yonge North Subway Extension service to Richmond Hill, GO regional rail service, VIVA Rapid Bus Transit and the encompassing major highways.

In Finland, land-use planning and transport-system planning are integrated, enabling TOD objectives to be present in railway/LRT planning early in the process. Efficient, integrated transportation has been an essential factor in the development of Kalasatama. The Kalasatama metro station connects the neighbourhood seamlessly to central and eastern Helsinki (Figure 5, p. 11).

The Kalasatama–Pasila tram line connects the bustling Kalasatama district with Pasila, a major business and public transit hub. All rail routes within Finland's railway network pass through Pasila, making it a critical node for national connectivity. The Helsinki International airport is a 25-minute trip by train. The station at Pasila is also integrated into Helsinki's tram network and serves as a central point for numerous bus lines. The station has been transformed with the construction of the Mall of Tripla, which includes a shopping center, office spaces, residential buildings, and a hotel. This development is part of a broader effort to densify the district and improve accessibility through public transit.

This Kalasatama-Pasila tram line is part of Helsinki's strategy to improve sustainable, high-capacity transit options for residents and commuters, reducing car dependency and enhancing connectivity between key urban areas.

Also, in Finland, The Vantaa LRT aims to create a reliable, efficient transit corridor, to encourage dense, mixed-use developments along its route, connecting residential, commercial and recreational spaces. The light rail line is strategically aligned to stimulate growth in emerging neighborhoods and revitalize established areas, attracting new residents and businesses. As a result, Vantaa LRT not only enhances connectivity and reduces car dependency but also supports transit-oriented development that fosters vibrant, walkable communities.

Construction is aimed to start by 2025 with the LRT system to be operational by the late 2020s. The light rail route will establish the most important growth channel of the city and is expected to bring approximately 60,000 new residents and 30,000 jobs.

New residential and job areas are planned from the perspective of the public transport system. The route of the light rail will form a development corridor, which will not only bolster the centres already located along the route but also create new vital small centres with their local services along the stops.

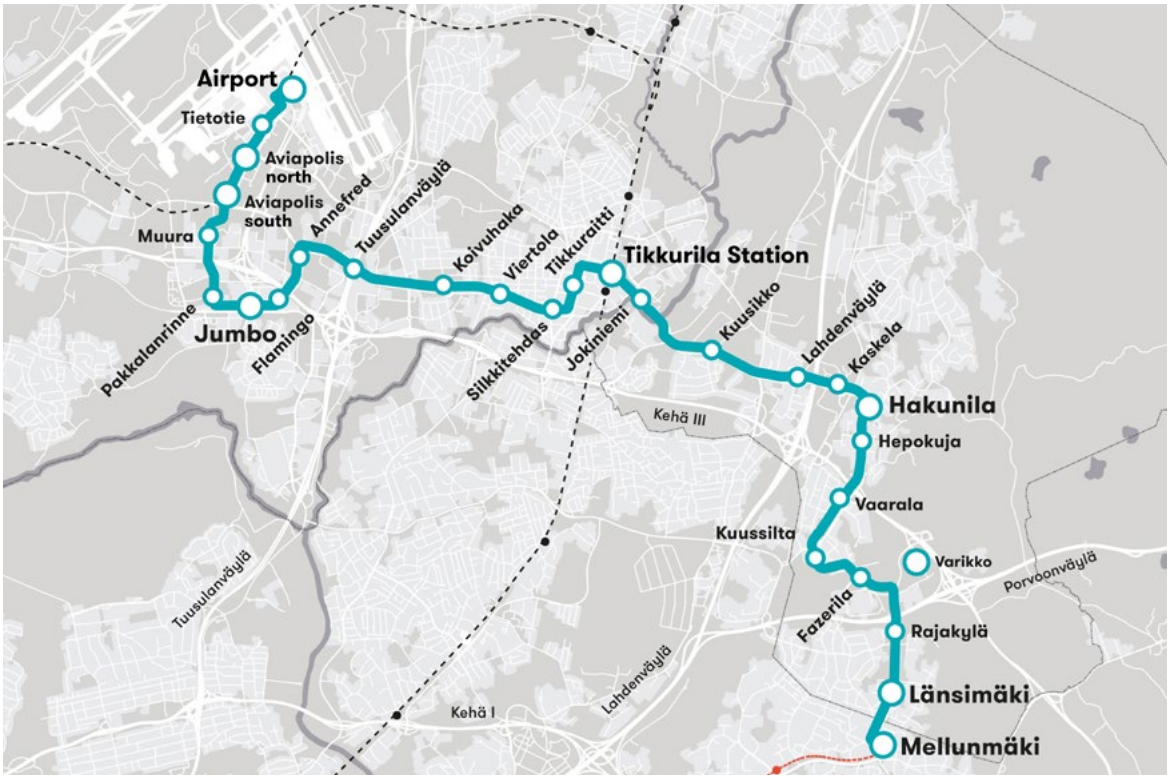

Figure 21 – Image: courtesy of Vantaa City – Vantaa LRT is 19 kilometres long and has 27 stops (with the average distance between stops being 800 metres). Tikkurila Station is the main transit hub (including the main railway line in Finland) and it is also the city centre of Vantaa. The western end stop is Helsinki International Airport, which also includes a local railway station.

Figure 22 – The Vantaa LRT route passes through the major districts representing Vantaa's strongest new growth corridor. The tramway increases the area's appeal and drives property development due to the permanence of the tram route.

Extensive public-transport connectivity is a key feature of the envisioned ONE Central location in Chicago, which includes the reconstruction of a commuter train yard, a new multimodal public-transit center, and a mixed-use development program of residential, office, hotel, retail, entertainment, open space and parking uses. Once at ONE Central, Chicago residents and visitors will be able to leisure, work and live. ONE Central will be the first location where all of the region's major public-transit agencies and the national passenger railroad will offer service in the same building. Riders could choose or change between a number of public-transport options, offering easy connections to the city and the world through this transit hub.

Figure 23 – ONE Central – WSP led the initial master plan and feasibility studies for this proposed 35-acre, 20 million sq. ft. mixed-use development project in Near South Side Chicago.

In Canada, WSP is working with the City of Vaughan, north of Toronto, on plans for a multimodal transportation network for its new downtown Vaughan Metropolitan Centre (VMC). Once complete, VMC will accommodate up to 140,000 people and jobs within 3.7 square kilometres, resulting in densities similar to that of NYC's Upper West Side. The mixed-use community is focused on a newly inaugurated subway station and features pedestrian priority zones, wide sidewalks, protected cycling facilities on most corridors and extensive parkland. A new collector and local urban grid roadway network was created (on lands that previously housed strip commercial and light industrial uses) specifically to accommodate the type of development envisioned in VMC.

Figure 24 – Vaughan, Toronto – rendering of the community at full build-out

BE FUTURE READY®

TODs typically take many years from inception to full build. The complexity of TODs—in terms of the considerations that should be taken into account when integrating transport infrastructure with urban development—requires planners to understand how trends in climate change, society, technology, and resources are affecting communities today and the potential impacts over time. Planning through this multifaceted lens allows for change, to meet the needs of developing populations.[9]

For example, a flexible street and block network is necessary to accommodate a variety of development types and uses while remaining adaptable to evolving market conditions over the project's build-out. This flexibility enables balancing the long-term vision for the station area with current market conditions and future market trends. Public transit needs can change as well.

In the United States, the Metropolitan Atlanta Rapid Transit Authority (MARTA) Indian Creek Station Transit Oriented Master Plan, Atlanta, Georgia, provides guidance to transform 30 acres of surface parking lots into a transit-oriented community. The master plan was developed with the help of over 500 community members attending in-person events. The TOD master plan proposes nearly 2 million square feet of mixed-use development centred around a new public park and transit plaza. A flexible street and block network is able to accommodate a variety of development types and uses while remaining adaptable to evolving market conditions. As a result of the planning and engagement process, the zoning has been updated to allow the master plan to be implemented.

Figure 25 – United States – MARTA Indian Creek Village Transit Oriented Development Master Plan, August 5, 2024, Atlanta, Georgia

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9 Future Ready® is WSP's global innovation program that seeks to better understand the key trends in climate change, society, technology, and resources and how they are impacting our world, locally and globally. The goal is to work with clients to design for future needs as well as those of today. Future Ready® is a registered trademark of WSP Global Inc. in Canada, the United States, New Zealand and Columbia. WSP Future Ready (logo)® is a registered trademark of WSP Global Inc. in Europe, Australia and in the United Kingdom.

Figure 26 – rendering – United States – community representation, MARTA Indian Creek Station TOD Master Plan in Atlanta, Georgia

To be future ready, master plans should not only embrace the current need for more housing but also the complementary aspects that support such housing, and sustainable living overall, into the future; these aspects, which can be hard and costly to retrofit, range from sustainable transport modes and associated infrastructure, including electric vehicle (EV) charging, to circular waste and nature-based solutions such as green infrastructure[10] and climate-resilient gardens.

To achieve circular-economy communities, the use of green infrastructure—or nature-inspired measures, from green rooftops to engineered wetlands—is becoming increasingly important in efforts to preserve, restore and support biodiversity gains and decarbonization. The Avon River neighbourhood / Te Papa Ōtākaro in Christchurch (Figure 2) and the HS2 Old Oak Common Station's urban parkland in London (Figure 13) demonstrate the integration of green infrastructure into urban environments. The principles applied in these projects are similar to those used in the sponge city design concept, which seeks to prevent flooding by absorbing rain, and can lead to improved air quality, the repurposing of rainwater and alleviation of urban heat.

As planning increasingly seeks to embrace sustainable solutions, TODs provide opportunities for consolidated waste, localized district green-energy grids and delivery centres, with last-mile deliveries by cargo bike, reducing the congestion that would otherwise come from servicing the freight needs of a dense community. Accommodating micromobility within the TOD catchment can also extend the range of the station and enable more people to live a car-free lifestyle.

The concept of mobility hubs is gaining increasing prominence with planners across the United Kingdom. Mobility hubs are locations where public-transport options are integrated with shared transport uses and community facilities; they should be located at the heart of the TOD community. The integration of shared modes, such as micromobility schemes including bike hire or e-scooters, encourages seamless travel and gives a range of transport options for local communities. For example, micromobility can complement rail stations by offering first-mile and last-mile sustainable travel options or provide alternative onward travel at bus stops. The integration of diverse community land uses enables stations to become places in their own right.

We approach mobility hub design the same way we design a piece of the city: creating a quality street environment to encourage walking and cycling, with frontages that give conviviality to the surrounding environment. Bus stops and drop-offs are incorporated along the street, and shared surfaces are encouraged to support a flexible mobility hub that is adaptable to different forms of mobility in the future.

A good TOD should incorporate last-mile transport solutions along the street rather than providing only a specific transportation infrastructure, such as a bus interchange, surrounded by tarmacs of bus bays with park-and-ride lots. A station should be a welcoming gateway into the city and a destination in its own right.

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10 Green infrastructure projects combine gray infrastructure (engineered assets) with nature-based solutions to create hybrid systems that improve resilience to climate impacts, while also often resulting in environmental, economic and social co-benefits. Reference: Environmental and Energy Study Institute.

Figure 27 – Concept design of mobility hub in Hunstanton, Norfolk in England – WSP has been leading in mobility-hub thinking and design in the United Kingdom, most recently developing the concept designs for a mobility hub in Hunstanton, Norfolk on behalf of Norfolk County Council.

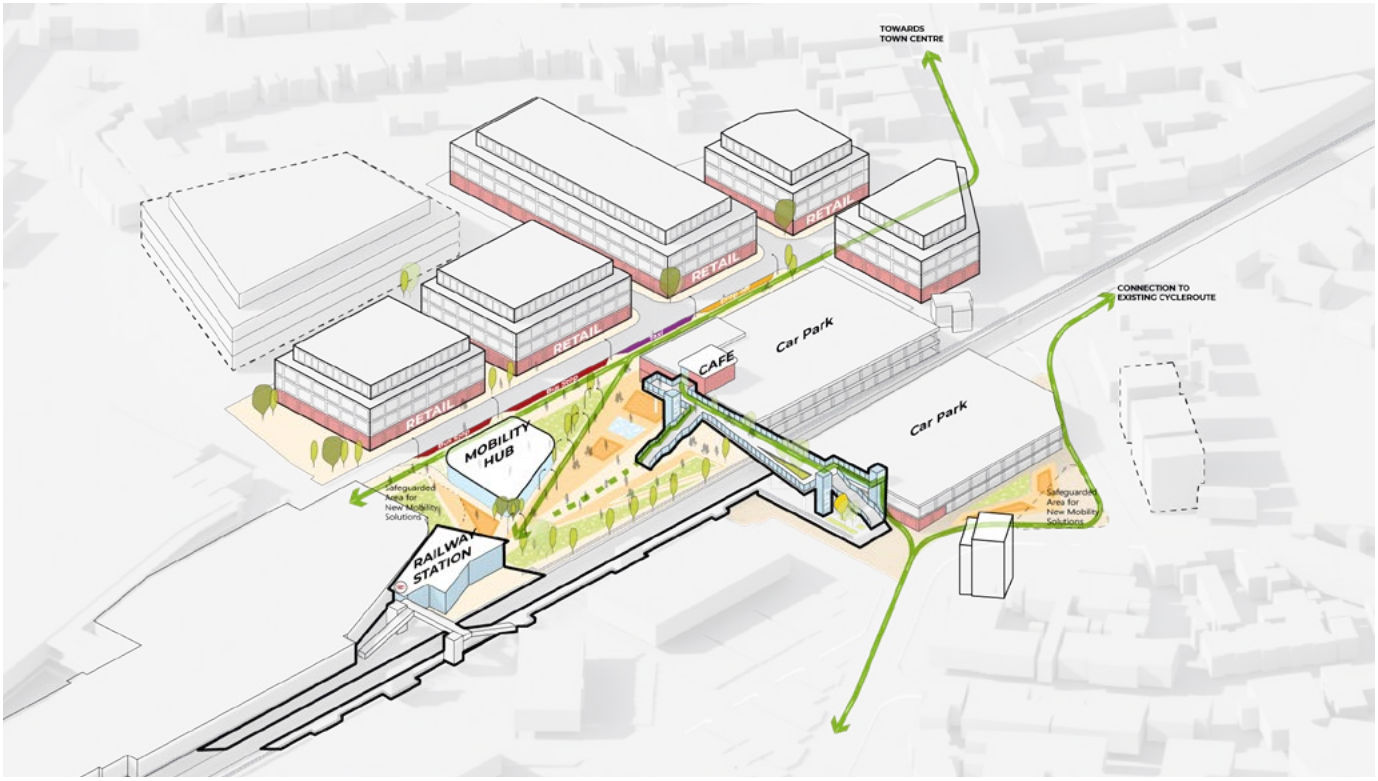

Figure 28—Above is a conceptual design of a station plaza redevelopment incorporating the concept of a mobility hub. A boulevard has been introduced at the heart of the redevelopment, with transport interchange services provided along the street, catering for the railway passengers' last-mile journey to their final destination. A new mobility hub for demand-response transport solutions is located at the station plaza, providing better access to the town centre and transport services for the community. New developments offer street frontages to the tree-lined boulevard, creating a quality urban environment to encourage the uptake of walking and cycling. This, together with the station plaza, provides a better sense of arrival in comparison to the traditional tarmac-dominated transport interchange environment.

CONCLUSION

Transit-oriented development—increasingly transit-oriented community—succeeds when great places are created around reliable transit. While the character of a great place will vary according to local culture, the basic elements of TOD are universal: a mix of uses, appropriate densities and the right amenities, built around a public-transport station offering multimodal connectivity.

TOD/TOC embraces a range of planning considerations involving stakeholders with varying responsibilities to support one holistic vision. An integrated approach to planning between public-transport agencies and local authorities is important for implementation. TOD typically requires bridging the conversation between the transit delivery body and the planning authority. This process safeguards operational requirements while optimizing the social, economic and environmental benefits of transit for the city. Optimizing the benefits of transit encourages greater usage, increasing fare revenue and boosting non-fare revenue through connectivity to neighbourhoods via TOD.

TODs also require public-private sector collaboration and financing and funding mechanisms to spur appropriate development that considers local community needs. Transit agencies, often through joint development, can generate revenue from TOD built on agency-owned assets.

Globally, positive outcomes accrue through co-locating residential and commercial spaces with amenities near accessible and reliable public transport. Transit agencies benefit as TOD encourages the use of rail and electric buses while mobility hubs support modal shift by expanding the reach of transit with options for last-mile transport. Pedestrian- and cycle-friendly streetscapes translate into healthier mobility habits. Inviting and inclusive urban public realms foster vibrant neighbourhoods.

As WSP continues to work with communities around the world to achieve local aspirations, TOC increasingly emerges as the sustainable solution to support growing urban populations. Properly conceived and implemented TOC results in long-lasting positive benefits that advance sustainable cities in a rapidly changing world.

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